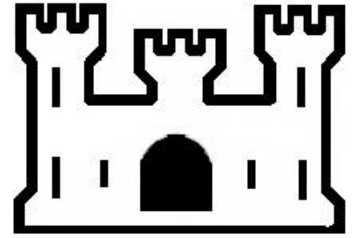


**US Army Corps  
Of Engineers  
Southwestern Division  
Reservoir Control Center**

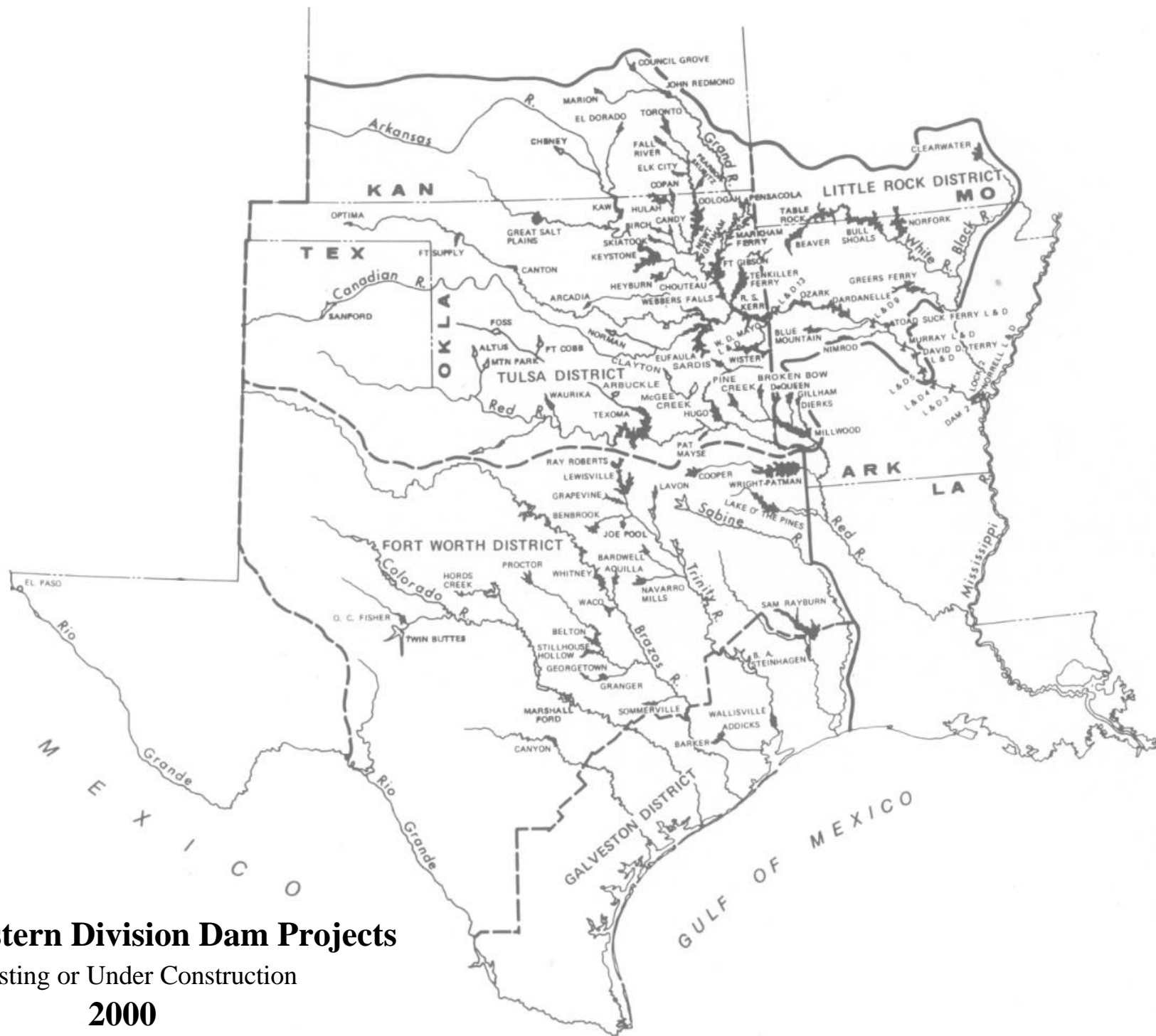


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# **FY 2000 Annual Water Quality Report**



**December 2000  
FOR OFFICIAL USE ONLY**



## Southwestern Division Dam Projects

Existing or Under Construction

**2000**

(With Section 7 Flood Control Projects Added)

**2000**

**ANNUAL WATER QUALITY REPORT**

**RESERVOIR CONTROL CENTER**

**SOUTHWESTERN DIVISION**

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**SECTION I**  
**INTRODUCTION**

## SECTION I – INTRODUCTION

**PURPOSE OF REPORT.** This report presents activities and accomplishments of the districts within Southwestern Division (SWD) as related to water quality management activities throughout FY00. Detailed summaries of water quality activities are also included.

This report is prepared in conformance ER 1130-2-234, Reporting of Water Quality Management Activities.

## **SECTION II**

### **WATER QUALITY ACTIVITIES IN FORT WORTH DISTRICT**

## **SECTION II - WATER QUALITY ACTIVITIES IN FORT WORTH DISTRICT**

### **1. Program Summary and Responsibilities.**

The Fort Worth District has an intensive water-quality sampling program on 9 out of 25 district lakes. During the fiscal year 2000, two detailed water quality reports for Grapevine Lake and Waco Lake were completed and forwarded to the Southwestern Division for review and approval. These reports were also furnished to those water storage contractors who have a need for this information.

### **2. Goals..**

Water quality monitoring and evaluation are essential components of the Fort Worth District's water quality program. It is designed to assess the water quality of selected Fort Worth District lakes and to accomplish the following basic objectives.

- a. Establish base-line conditions at these projects.
- b. Identify water quality problems and resolve those problems where possible.
- c. Gather monthly dissolved oxygen and temperature data to be used for thermal simulation modeling of lake projects during the design or modification stages to determine multilevel outlet sizing and location.
- d. To evaluate annual water-quality trends and to establish the magnitude of natural annual variations.

### **3. Organization and Staff..**

Presently, the Fort Worth District's water quality staff consists of one full-time and one part-time hydraulic engineer. District personnel involved in water quality work are listed in Table 1.

**Table 1**  
**Fort Worth District**  
**Water Quality Staff**

<b>Name</b>	<b>Org. Code</b>	<b>Title</b>	<b>Phone #.</b>	<b>FAX #</b>	<b>Gra</b>	<b>Exp. YRS</b>
Shah Khan	CESWF-OD-L	Hydraulic Engineer	817-978-8474	8-2176	GS-12	10
Paul Lauderdale	CESWF-OD-L	Hydraulic Engineer	817-978-3134	8-2176	GS-11	1

#### **4. Sampling Program.**

The Fort Worth District has an intensive water-quality sampling program on 9 out of 25 district lakes. The monitored lakes during the fiscal year 2000 were Lavon, Cooper, Navarro Mills, Somerville, Bardwell, Grapevine, Waco, Whitney, and Lake O' the Pines. The Fort Worth District, under its intensive sampling program, monitors the condition of lakes, upstream and downstream. Evaluation of the water quality data is based on water quality standards and criteria established by the Texas Natural Resource Conservation Commission (TNRCC), and the U.S. Environmental Protection Agency (USEPA), as well as other states quality standards which are designed to protect key beneficial uses. The water quality parameters that are monitored include biological, physical, chemical, temperature, and dissolved oxygen. The USGS, WES, and other established labs are used to analyze these samples. The data collected are stored in the USEPA database "STORET" and in the USGS database "National Water Information System" (NWIS). The data are published yearly in the USGS Water Resources Data publications. Statistical analyses are performed on about 40 water quality parameters. Our office coordinates with the above mentioned agencies and river authorities during the interpretation phase of the collected data. We also obtain permitted wastewater loading reports in Texas rivers from TNRCC, which we use in our water quality analyses.

#### **5. Training.**

During the fiscal year 2000, one of the water quality team members attended the National Water Quality Monitoring Council's conference on water quality held at the Hyatt Regency, Austin, Texas during April 25-27, 2000. He also attended the Corps of Engineers' Seminar on water quality held August 28-31, 2000 at the Radisson Hotel in St. Paul, Minnesota. The team members will be scheduled for more water quality modeling and management courses as time and funds are available.

**6. Research and Development Needs.**

None are anticipated during the next FY.

**7. Assistance from Committees or Outside Sources.**

No assistance was requested in the FY 2000.

**8. Project Narratives.**

The Corps of Engineers awarded a \$22,350.00 Somerville Lake water quality sampling contract in fiscal year 2000 to the Texas A&M University, Department of Wildlife and Fisheries Sciences. Part of the work under this contract includes cyanotoxin analysis, which was required due to high concentrations of blue green algae at Somerville Lake. Water quality sampling is usually handled by the USGS under a cooperative agreement through the USACE.

However, the USGS did not have the capability to perform the cyanotoxin analysis. Furthermore, the Corps of Engineers will save approximately 20% each year by utilizing this contract with the Texas A&M University.

From the data available, we found no major water quality problems in any of the Fort Worth District projects, which are sampled intensively.

### **SECTION III**

## **WATER QUALITY ACTIVITIES IN GALVESTON DISTRICT**

## **SECTION III - WATER CONTROL ACTIVITIES IN GALVESTON DISTRICT**

### **1. Program Summary and Responsibilities.**

Water Quality investigations for proposed projects are conducted in the Planning Division. Project specific, activities range from water and sediment sampling with basic insitu analysis to groundwater and soil borings collection. Associated laboratory analyses varies from basic parameters to a full range of Priority Pollutants. The Planning Division also conducts water quality activities for project maintenance. Work generally consists of water, sediment and elutriates analysis prior to dredging.

### **2. Goals.**

Water quality research and activities are primarily focused on maintenance of navigational waterways and flood control projects. District goals include maintaining state standards while minimizing water quality impacts, and maximizing environmentally beneficial uses of dredge material.

### **3. Organization and Staff.**

District personnel involved in water quality work are listed in Table 2.

**Table 2  
Galveston District  
Water Quality Staff**

<b>Name</b>	<b>Org. Code</b>	<b>Title</b>	<b>Phone #.</b>	<b>FAX #</b>	<b>Gra.</b>	<b>Exp. YRS</b>
Kristy Morten	CESWG-PL-R	Biologist	409-766-3045	3064	GS-11	21
Robert Hanch	CESWG-CO-T	Physical Scientist	409-766-3913	3064	GS-12	19

**4. Sampling Program.**

Water quality activities are conducted on as –needed basis for new projects and waterway maintenance dredging. The District does not have regular water quality monitoring programs.

**5. Training.**

Training and workshops are attended as needed to maintain level of competency. Training needs include watershed management and other TMDL related issues.

**6. Research and Development Needs.**

None are anticipated in the next FY.

**7. Assistance from Committees or Outside Sources.**

No assistance was requested this FY.

**8. Project Narratives.**

The Galveston District does not own or operate standard water storage reservoirs or lakes. As such, the District does not conduct routine water quality monitoring programs. The District manages two flood control reservoirs, Addicks Reservoir and Barker Reservoir, in Houston, Texas. Designed to store floodwaters, the reservoirs are dry the majority of the year and support various recreational uses.

## **SECTION IV**

### **WATER QUALITY ACTIVITIES IN LITTLE ROCK DISTRICT**

## SECTION IV - WATER QUALITY ACTIVITIES IN LITTLE ROCK DISTRICT

### 1. Program Summary and Responsibilities.

The District water quality management programs are divided among the Operations Division and the Planning, Environmental, and Regulatory Division by functional missions. A water quality specialist from the Reservoir Control Branch is the District Point of Contact responsible for coordinating water quality matters within the District. Responsibility for water quality studies within the Divisions are assigned the various elements based on the nature of the study. Specific activities of the Divisions are discussed under Section 4., Sampling Program.

### 2 . Goals.

- a. Manage water releases from reservoirs to best balance water quality needs with project purposes.
- b. Identify existing & potential reservoir water quality related problems & take appropriate actions consistent with our mission & authority.
- c. Provide safe drinking water for public use.
- d. Provide safe swimming areas following state health regulations.
- e. Ensure Corps' project compliance with wastewater discharge permits.
- f. Ensure water quality is addressed in the regulatory program.
- g. To support HTRW efforts.

### 3. Organization and Staff.

District personnel involved in water quality work are listed in Table 3. All work only part-time on water quality duties.

**Table 3**  
**Little Rock District**  
**Water Quality Staff**

Name	Org. Code	Title	Phone #.	FAX #	Gra.	Exp. YRS
Gordon Bartelt (POC)	CESWL-CO-R	Hydraulic Engineer	501-324-6236	-5903	GS-12	27
Max D. Frauenthal	CESWL-ET-WP	Chemical Engineer	501-324-5197	-5605	GS-12	7
Clyde P. Gates	CESWL-OP-ON	Biologist	501-324-5675	-5899	GS-12	24
Kenneth H. Lyon	CESWL-PR-R	Project Manager	501-324-5296	-6013	GS-12	22
Richard Young	CESWL-OP-OM	Civil Engineer	501-324-5742	-5159	GS-12	6
Joyce Perser	CESWL-PR-R	Reg. Proj. Manager	501-324-5295	-6013	GS-12	5
Tony Hill	CESWL-PR-P	GIS Manager	501-324-5834	-5605	GS-11	5

**Table 3**  
**Little Rock District**  
**Water Quality Staff**

<b>Name</b>	<b>Org. Code</b>	<b>Title</b>	<b>Phone #.</b>	<b>FAX #</b>	<b>Gra.</b>	<b>Exp. YRS</b>
Mike Rodgers	CESWL-PR-P	Biologist	501-324-5030	-5605	GS-11	9
Steve Robinson	CESWL-PR-R	Env. Protection Spec	501-324-5295	-6013	GS-11	26
Sheila Ellis	CESWL-OP-OM	Statistical Asst	501-324-5737	-5159	GS-06	5

**4. Sampling Program.**

The District water quality management programs are divided between Operations Division and Planning, Environmental, and Regulatory Division by functional missions.

**a. Operations Division Responsibilities.** Responsibility for water quality work within the Operations Division is assigned to the various elements based on the nature of the work.

**(1) Reservoir Control Branch.** A water quality specialist from the Reservoir Control Branch is the District Point of Contact. This person is responsible for coordinating water quality matters within the District. The Branch is responsible for coordinating dissolved oxygen profiles at our reservoirs and release monitoring. Due to the special dissolved oxygen considerations at the White River multipurpose projects during the summer and fall months, water quality data are obtained for operational purposes. Lake profiles are taken monthly at Beaver, Table Rock, Bull Shoals, Norfolk, and Greers Ferry. This is increased to biweekly as conditions worsen, during the critical dissolved oxygen period, August through the autumnal overturn in December. Data for the profiles are taken approximately 1000 feet upstream of the dam, and includes temperature, specific conductance, dissolved oxygen and pH.

**(2) Maintenance Engineering Section.**

**(a) Bathing Beach Monitoring.** Project office personnel perform the District's bathing beach-monitoring program during the swimming season to insure safe bacterial quality of reservoir waters. Samples are taken weekly for five weeks, then once a month for the remainder of the swim season. Beginning in 1997, the Arkansas Department of Health agreed to collect baseline, pre-Memorial Day and pre-July 4th samples and all necessary re-samples. We collect routine monthly samples during the months of July, August and September. The Missouri and Arkansas Health Departments analyze samples free of charge. This program is administered in accordance with SWD Regulation 1130-2-9 and applicable State Laws.

**(b) Potable Water Monitoring.** Potable water supplies of the District are tested for physical, chemical, and bacterial quality. Samples are collected by project office personnel and mailed to the appropriate health departments, which perform the analyses for a nominal fee. When tests indicate a bacterial problem, corrective measures are immediately taken. In some cases chronic problems detected by this sampling cause wells to be replaced, reworked, or closed. Also, we are attempting to obtain municipal water services to replace well systems where possible. This program is conducted in accordance with ER 1130-2-407 and applicable Federal and State drinking water standards for non-community water supply systems.

**b. Planning, Environmental, and Regulatory Division Responsibilities.**

**(1) Environmental Team.** The district's lake water quality program is handled through the Environmental Team of the Planning Branch. Data collection and listing of the 12 reservoirs other than the mainstream of the Arkansas River within the Little Rock District was contracted with the private sector. There are no state or Federal programs that routinely provide these data on the reservoirs operated by the Corps. Samples for about 28 parameters at 88 stations on these multipurpose projects are performed three times during the year -- in the winter, spring and fall. Once samples are collected, the data is sent to the Corps for further analysis and record keeping. These data are used to identify pollution sources, determine water quality trends and changes in all areas of the reservoirs, and to properly manage each reservoir on an individual basis with regard to safety and water quality standards. These determinations include the identification of potential pollution sources so as to enable the Corps to have meaningful input in decision-making processes of other agencies and groups with regulatory authority over basin discharges. This program is conducted pursuant to ER 113-2-334.

**(2) Regulatory Branch.**

**(a) Dredged Material Analysis.** Periodically, a bottom sediment survey is performed at twelve locations along the Arkansas River Navigation System, and less frequently at other locations on other District rivers and reservoirs. Sediment and water column samples are collected, and sent for laboratory analyses. The purpose of this program is to detect potential effects of dredging operations on water quality, and to have these data available for the required 404(b)(1) evaluations of future Corps and private dredging. These operations include both commercial dredging under Corps permits and channel maintenance dredging performed under Corps of Engineers contract. The results are also used to update the water quality database on the Arkansas River.

(b) **Special Activities.** Regulatory Branch periodically conducts cooperative water quality studies with other agencies in monitoring activities authorized under Corps Section 10 and 404 permits. Regulatory Branch personnel are also involved on a daily basis with personnel from the Arkansas Department of Environmental Quality in the evaluation of Department of the Army permit applications and resolving the water quality matters arising therein.

(c) **Data Management.** Reservoir water quality data are entered into STORET, the computerized data management system of the EPA. The water quality data collected in conjunction with the low dissolved oxygen problem at the White River projects are stored in DSS files on SWL's WCDS computer. Results of potable water, bathing beaches, NPDES, and other monitoring are kept in computer storage, log books, or files as appropriate. Special data collection results are contained in the reports dealing with the specific subject for which the data were collected.

**5. Training.**

Training needs include basic training in water quality modeling and watershed management for improving water quality. Training will be scheduled if appropriate courses and funds are available.

**6. Research and Development Needs.**

Research needs include improved water quality models and watershed management techniques.

**7. Assistance from Committees or Outside Sources.**

No assistance was requested in the last FY.

**8. Project Narratives.** We have ongoing special studies and operations related to water quality at several of our 12 multipurpose reservoirs in the District.

- a. **White River Lakes.** Lake dissolved oxygen (DO) profiles are taken monthly during summer and fall at Beaver, Table Rock, Bull Shoals, Norfork, and Greers Ferry. This is increased to biweekly as conditions worsen, and weekly during the critical dissolved oxygen period, August through the autumnal overturn in December. The profile data are used by Reservoir Control Branch personnel to monitor DO conditions in the lakes. They then regulate hydropower releases to maintain dissolved oxygen levels at 4 mg/l or greater in the releases. Data collection is done by the USGS under a contract between SWL and the Arkansas Soil and Water Conservation Commission.

Continuous recording temperature and dissolved oxygen monitors connected to Satellite Data Collection Platform's have been installed below these lakes also. They let us know how well we are doing at maintaining the DO. Another purpose of this monitoring is to evaluate mechanisms, which can provide an appropriate temperature and DO regime in releases from the lakes to meet Missouri and Arkansas State standards of 6 mg/l dissolved oxygen and a maximum temperature of 75 degrees.

In addition to the regulation of hydropower releases mentioned above, we have also made turbine modifications such as improved vent pipes, and the addition of hub deflectors at Bull Shoals and Norfolk to increase airflow to the turbines. At Table Rock we are using penstock oxygen injection. These are all temporary measures that won't get the DO up to 6 mg/l. A more permanent solution to the low dissolved oxygen in hydropower releases is needed.

In an effort to find this permanent solution, personnel from the TVA, which has considerable experience with improving DO in hydropower releases at their projects, were invited to visit the projects and to help SWL determine the most reasonable aeration alternatives. A preliminary study by the Tennessee Valley Authority has lead to several proposals for permanent solutions to reach 6 mg/l DO. These include the use of reaeration weirs, autoventing turbines, oxygen injection, alone or in various combinations.

We have some problems with fecal coliforms. Occasionally, counts from a sample do exceed the recommended state maximum for body contact. These sporadic exceedences are short term. We had one beach closed at Beaver for about one week, and one at Greer's Ferry for about two weeks this past year. The closures are almost always associated with rainfall and local runoff events. Long term bathing beach sampling shows no consistent pattern or negative trends at any site.

- b. White River Minimum Flows.** The White River Basin in Arkansas and Missouri contains five Corps multiple-purpose lakes: Beaver, Table Rock, Bull Shoals, Norfolk, and Greers Ferry. Section 374 of WRDA '99 modifies the authorization of these projects to include specific amounts of project storage to provide minimum flows to sustain natural reproduction in the trout fishery. Prior to this authorization, water management decisions affecting lake levels and downstream flows were based primarily on flood control and hydropower needs. WRDA 99 directs the Corps to reallocate the following amounts of storage: Beaver Lake, 1.5 feet; Table Rock Lake, 2 feet; Bull Shoals Lake, 5 feet; Norfolk Lake, 3.5 feet; and Greers Ferry Lake, 3 feet. The stored water will be used to make releases during periods when hydropower is not being generated. These minimum flows are intended to sustain the trout fishery. These changes cannot be carried out until this study determines that this work is technically sound, environmentally acceptable, and economically

justified. The Corps under Section 216 of the Flood Control Act of 1970, reevaluation of completed projects, reprogrammed \$100,000 of O&M funding to initiate the study effort. The Corps has used these funds for conducting public involvement activities of the study. Four public workshops were held in Rogers, AR; Branson, MO; Mountain Home, AR; and Heber Springs, AR to notify interested parties of the proposed study and receive their comments. The Corps is also having meetings with both state fisheries agencies and the Southwestern Power Administration. A status report of activities to date was completed 14 July 2000. Proposed for FY2001 is the completion of the plan to provide sufficient minimum flows from the White River Basin Lakes to sustain the trout fisheries, and to provide for the aquatic ecosystem. The study will address the impact implementation of such a plan will have.

- c. **Beaver Tailwater Restoration.** The project area is located immediately below Beaver Dam along the White River in Carroll County, Arkansas. The proposed modification consists of restoring 4 miles of channel and banks of the upper White River damaged by high flows from Beaver Lake releases. The modification consists of stabilizing the banks with riprap, log cribs and bank vegetation; re-establishing the primary river channel by placing boulders and stone revetments in the stream; and improving habitat by placing root wads, logs, and boulders in the stream. The estimated cost to implement the project is \$104,000 and will be cost-shared 75% Federal and 25% with the local sponsor, the Arkansas Game & Fish Commission (AGFC). AGFC will provide their contribution of \$7,800 in cash and \$18,200 in work-in-kind services, including providing boulders and logs for 60 in-stream habitat structures, cedar trees and logs for three retaining walls, and boulders for one stone weir. The plans and specifications and cost estimate were completed in May 2000. Project approval was received August 2, 2000. The Project Cooperative Agreement was executed on September 6, 2000.
- d. **Nimrod Fisheries Restoration.** The project area is on Nimrod Lake located near Plainview, AR, in Yell County, on the Fourche LaFave River. The proposed modification consists of the selective planting of willow and buttonbush vegetation along approximately 100,000 linear feet of the shoreline, and the placement of 35 fish shelters constructed from the culled trees on project lands to provide necessary fish habitat. A water level manipulation plan will be implemented that allows for the survival and regeneration of shoreline vegetation necessary in the life cycle of many fish species in the lake. The total cost of the project was estimated to be \$106,800, of which the Federal share is \$80,100, and the non-Federal share is \$26,100 consisting of \$5,400 in cash and \$21,400 in work-in-kind services. Construction was completed March 13, 2000. The project was turned over to the local sponsor, the Arkansas Game & Fish Commission, on March 28, 2000.

- e. **Pine Bluff Wetland Restoration.** The Pine Bluff Wetland Restoration Project will be located on approximately 130 acres in the Pine Bluff Regional Park designated as the future Pine Bluff Nature Center. Lake Langhofer will border the proposed nature center on the east. The lake is an old bendway of the Arkansas River and is 8 miles long and covers approximately 2,000 acres. The proposed modification consists of constructing one 8.5-acre wetland, creating several food plots, and reforesting about 10 acres. The estimated cost of the restoration plan is \$218,200, and the local sponsor's share, the city of Pine Bluff, is 25%, or \$54,600 which consists of \$25,000 in lands and \$29,600 in work-in-kind services. The Project Report Plan was prepared and submitted to SWD on February 1, 2000. SWD approved the PRP and provided funds to initiate the plans and specifications on February 24, 2000. Plans and specifications are scheduled to be completed October 2000. Construction is scheduled to be completed April 2001.
- f. **Release Modifications at the Tri-Lakes.** Low-flow structures at Gillham, De Queen, and Dierks reservoirs release surface water, when the reservoirs are stratified, to help maintain warm water fisheries downstream. To reduce sudden temperature changes on the fishery, small changes in release rates are made when mixing warm water from the low-flow structures and cold water from the conduit. This procedure, which requires a large number of gate changes, occurs during the transition from low flow to flood releases and vice versa.
- g. No water quality operations other than the routine sampling described in (1)(b) above occurred at Blue Mountain, Clearwater reservoirs. Millwood Reservoir had swim beaches closed because of fecal coliforms several times. This is not unusual for this lake since it is located in an agricultural area. Long term bathing beach sampling shows no negative trend at any site.

**SECTION V**

**WATER QUALITY ACTIVITIES  
IN TULSA DISTRICT**

## **SECTION V - WATER QUALITY ACTIVITIES IN TULSA DISTRICT**

### **1. Program Summary and Responsibilities.**

Historically, water quality studies performed by District personnel fall under two categories: baseline and monitoring. Baseline studies are designed to collect a large amount of data over a short period of time, usually April through October, what is generally considered the growing season. Monitoring programs are long-term, measure fewer parameters than baseline studies, and are tailored to the data needs of each lake. In FY 00, personnel in the Environmental Analysis and Compliance Branch (EACB) were responsible for the overall water quality program in the District. They developed sampling plans, wrote scopes of work, collected water samples and field data, performed some sample analyses, and managed data. In addition, they were responsible for data analysis and report writing. Other responsibilities included ordering materials and supplies, maintaining water quality instruments, and providing water quality information to interested parties.

### **2. Goals.**

The goals of the program are to (1) complete one baseline study at each lake that characterizes existing water quality and provides a data set for comparison with future studies, (2) develop monitoring programs to track changing water conditions and guide future lake management decisions, and (3) coordinate annual programs with interested State agencies and local organizations.

### **3. Organization and Staff.**

In FY 00, 1.5 FTEs in the Planning, Environmental, and Regulatory Division were devoted to the water quality program. These FTEs are located in the Environmental Analysis & Compliance Branch. District personnel involved in water quality work are listed in Table 4.

**Table 4**  
**Tulsa District**  
**Environmental Analysis & Compliance Branch**  
**Organization & Staff**

<b>Name</b>	<b>Org. Code</b>	<b>Title</b>	<b>Phone #</b>	<b>FAX #</b>	<b>Gra.</b>	<b>Exp. YRS</b>
John Carroll	CESWT-PE-E	Limnologist	918-669-7659	-7546	GS-12	28
Steve Nolen	CESWT-PE-E	Limnologist	918-669-4359	-7546	GS-12	20

#### **4. Sampling Program.**

Sampling programs are developed specifically for each lake being studied. For baseline studies, fixed sites are located in key areas (e.g., dam site, mid-lake, upper lake, coves with pollution source, and if possible, the stilling basin). A minimum of three sites per lake is established. Vertical profiles of dissolved oxygen, water temperature, pH, and conductivity are measured at each site on each sampling trip. Secchi disk transparency and turbidity are also measured each time. In addition, water samples are collected at the surface and about one meter above the bottom for analysis of several parameters, including nutrients (phosphorus and nitrogen series), total metals, and other inorganic parameters (alkalinity, hardness, chloride, sulfate). Chlorophyll *a* is also measured at each site except the stilling basin. For monitoring programs, a different approach is taken. Normally, specific parameters are of interest, so several random samples are collected monthly to define temporal and spatial variation within the lake. The number of monthly samples is statistically determined by whatever error rate (+/- units) for a parameter is deemed to be reasonable. Sampling sites for each trip are randomly generated by a computer from a numbered grid on a map of the lake.

#### **5. Training**

No employees attended training courses this past FY.

#### **6. Research and Development Needs.**

None are anticipated in the next FY.

#### **7. Assistance from Committees or Outside Sources.**

Dr. Jim Schooley, Professor of Biology, Northeastern State University, Tahlequah, assisted EACB personnel under an IPA agreement. He assisted in evaluating water quality data and preparing water quality reports, in addition to advising on special projects.

#### **8. Project Narratives.**

##### **(1) Baseline Studies.**

The field work for baseline studies were completed at Hugo, Pine Creek, and Great Salt Plains Lakes in Oklahoma. Data has been put on spreadsheets and will be formatted for entry into the EPA STORET national water quality data system.

A congressionally funded study aimed at evaluating water quality concerns in Oologah Lake, Oklahoma, was initiated This special study is being administered by the Tulsa District with assistance from the City of Tulsa and other Federal and State agencies. Owing to recent concerns expressed by water supply users, initial phases of the study

were aimed at evaluating potential water quality-related threats from: (1) excessive sedimentation and inorganic turbidity, (2) petroleum-related contaminants, and (3) excessive nutrient loading. Activities during this first year included extensive in-lake data collection for problem identification, definition of lake bathymetry, monitoring of major tributaries for load estimation, set-up and application of a predictive water quality model (CE-QUAL-W2), and establishment of a GIS-base data base. This year was the first of a planned three year study.

## **(2) Water Quality Reports.**

Baseline water quality reports were completed for Pat Mayse Lake in Texas, and Birch and Heyburn Lakes in Oklahoma. These reports describe existing water quality and discuss potential problems.

## **(3) Monitoring Programs.**

### **(a) Broken Bow Lake, OK.**

The fourth year of a monitoring program was completed at Broken Bow Lake. The purpose of this program is to identify water quality trends in the lake, with the emphasis on the potential for increased eutrophication rates because of watershed activities. The four years of data will be evaluated to determine what future actions might be needed to maintain the high quality of the lake water.

### **(b) Lake Texoma, OK & TX.**

The third year of a water quality monitoring program is being conducted at Lake Texoma by the University of North Texas, Denton. This program is a part of planned environmental studies related to the proposed chloride control plan above Lake Texoma. In addition to the above monitoring program, Tulsa District personnel are also working with EPA and other Federal and State agencies on a basin-wide study of contaminant sources and potential effects of these contaminants on the system assimilative capacity of the lake. This project is funded by EPA.

### **(c) Lake Kemp, TX.**

The second year of a water quality monitoring program was conducted at Lake Kemp by Texas Tech University, Lubbock. The purpose of this program is to obtain baseline water quality data associated with the Wichita River Basin Project.